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Synopsis of the proposed research plan

Title of the research proposal

‘PROSPECTING PHYTOCHEMICAL AND BIOMEDICINAL POTENTIAL OF SOME SELECTED *FICUS* SPECIES FROM NANDED REGION OF MAHARASTRA.’

Submitted for the degree of

Doctor of Philosophy in

Botany

Under faculty of Science and Technology

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Introduction

Prospecting is important phenomena which refers to prospect the glimpage of biological potential in transforming indigenous knowledge to new to new scientific domain. Among the rich biodiversity ,plants represent large swath which has shaped the biosphere and enlightened inhabitants since life arose (Baker and Satish, 2013). In various developing countries, medicinal plants play an essential role in primary healthcare due to the lack of modern infrastructure, healthcare, traditional acceptance, a huge amount of pharmaceutical drugs, and the efficacy of medicinal plants for treating certain disorders not treated with modern therapeutics (Saklani and Chandra, 2011). Over 800 *Ficus* species exist, including plants, vines, shrubs, epiphytes, and hemiphytes. Figs or fig trees are called *Ficus* plants. Despite its tropical and subtropical distribution, the genus is mainly found in Asia, America, Australia, and Africa (Rahman and Khanom, 2013). Herbal medicine stretches back to the cult of humanity. Indian traditional medical systems including Ayurveda, Siddha, Unani, and Homeopathy are playing a key role in healthcare (Saklani and Chandra, 2012).

In India thousands of species are known to have medicinal value and the use of different parts of several medicinal plants to cure specific aliments has been in vogue since ancient times. There are more than 35,000 plant species being used in various human cultures around the world for medicinal purpose. About 80 % individuals from developing countries rely on plant based preparations used in their traditional medicinal system and as the basic needs for human primary health care. Medicinal plants are a source of great economic value all over the world. Nature has bestowed on us a very rich botanical wealth and a large number of diverse types of plants grow in different parts of the country. Medicinal plants have played important role in the traditional and orthodox system of medicine in the curing of different types of diseases.

Drug resistant bacteria are the main causes of bacterial infections, especially Gram negative bacteria. Medicinal plants are the rich source of antibacterial agents. From ancient times, many plants are used to prepare different types of medicines to cure bacterial infections. *Ficus religiosa, Ficus benghalensis, Ficus elastica, Ficus benjamina*

and *Ficus infectoria* are important ingredients of many medicinal formulation in Ayurveda. *Ficus* represents more than 800 species and are used to treat various bacterial infections and diseases that are the leading cause of morbidity and mortality worldwide. According to WHO report, approximately 80% of the world population rely on plants or plant derived products for the treatment of diseases. (Bhawana and Robin 2018).

Ficus genus is one of the important genus of family Moraceae and is known to be widely reported from Nanded region. The different species of *Ficus* from this region are yet to be explored for its beneficial values. Therefore in the current research work we have decided to expose their phytochemical and biomedicinal potential in the benefit to mankind.

Review of literature (Previous work done in the relevant area)

Arshia Ghanbari et.al. (2019) studied biological activities of *Ficus carica* latex for potential therapeutics in Human Papilloma Virus (HPV) related cervical cancers. They reported that one of the plant, the *Ficus carica*, whose fruit latex, when applied on HPV-induced skin warts, has shown potential as a possible cure for this virus related lesions. This study explores the in vitro biological activities of latex and elucidates its possible mechanisms of action on cervical cancer cell lines CaSki and HeLa positive for HPV type 16 and 18, respectively. These findings suggest *Ficus carica* latex has the potential to be used in the development of therapeutic modalities for the possible treatment, cure and prevention of HPV related cervical cancer.

Suganya Murugesu et.al.(2021) reviewed the medicinal uses, phytochemistry, and pharmacological actions of two major species from this genus, namely *Ficus benghalensis* and *Ficus religiosa*. They reported that the chemical analysis of *Ficus* species contained a wide range of phytoconstituents, including phenols, flavonoids, alkaloids, tannins, saponins, terpenoids, glycosides, sugar, protein, essential and volatile oils, and steroids.

Md. Shahadat Hossain (2014) studied antimicrobial activity methanol extracts of *Ficus racemosa* Linn., belonging to the family Moraceae, the in vitro study done on using disc diffusion method against human pathogenic bacteria fungi. He reported that the potential

of antibacterial activity against all the tested Gram negative and Gram positive bacteria: *Staphylococcus aureus, Bacillus subtilis, Vibrio cholera, Bacillus cereus, Salmonella typhi, Shigella dysenteriae, Pseudomonas aeruginosa, Klebsiella* species and Proteus species as well four fungi: *Alternaria* and *Collectotrichum spp.*

Md. Mahmudul Aminet.al. (2015) reviewed large number of herbal drugs stated to possess anti-diabetic activity in the Ayurvedic system of medicine, accordingly *Ficus racemosa* is being widely used by the traditional practitioners in the prevention and treatment of diabetes over many centuries in Bangladesh. They reported that the fruit, bark, latex, seeds or leaves of *F. racemosa* plant have been reported to decrease blood glucose levels and improve body weight in diabetic animals when administered in different pharmaceutical preparations.

Manoj Aswar et. al. (2008) carried out preliminary phytochemical investigation on *Ficus benghanlesis*. They reported presence of carbohydrates, flavanoids, amino acids/proteins, steroids, saponins and tannins in aqueous and methanolic extract while flavanoids and steroids were present in chloroform extract. All the extracts were screened for antimicrobial activity against six bacterial species (*Bacillus subtilis, Staphylococcus aureus, Pseudomonas aeruginosae, E.coli, E.coli mutant, Klebsiella pneumoniae)* and one fungal species (*Aspergillus niger*), by using the cup plate method. The results obtained showed that the extracts of *Ficus benghanlensis* exhibits antibacterial and antifungal activity.

Rajan Logesh et.al. (2023) reported various plant parts of *F. benghalensis* were found to be used in Ayurveda, Siddha and other traditional medicine systems in South Asia. They found that the stem bark were used mostly for the treatment of diabetes, diarrhea, and dysentery. The latex is used for the treatment of wounds, burns, and rheumatism. Fruits are edible and are used as a tonic. Regarding phytochemistry, leucoanthocyanindin derivatives and triterpenes were reported from the stem bark and triterpene derivatives and phenolic compounds including flavonoids were reported from the leaves.

Objectives of Research / Proposed Hypothesis

1) Ethanomedicinal survey of *Ficus* genus from Nanded region.
2) Phytochemical analysis of some selected plants of *Ficus*.
3) Determination of antimicrobial potential of selected plants of *Ficus*.
4) Antioxidant studies of some selected plants of *Ficus*.
5) Determination of anticancer and antidiabetic efficiency of selected plants.
6) HPTLC studies.

Methodology to be adopted:-

The current research work will be completed using standard and established protocols.

Phase I: -Literature Survey, collection and identification of Plant Materials.

In the first phase of research work extensive literature survey will be done in order to know latest scenario of research in undertaken and allied area. The ethno botanical survey and collection of plant material will be done by giving personal visit to field and also by interacting with some local tribal healers. The collected plant materials will be identified by using standard floras (Cooke 1967; Naik 1998).

Phase II:-Plant Extraction and phytochemical analysis.

Plant samples will be collected from the fields and extracted for phytochemical analysis by standard using prescribed methods. (Harborne,1973).

Phase III:-Antimicrobial Studies.

By using standard protocols, in third phase the antimicrobial activity of plant extracts of *Ficus* genus will be tested against different fungi and bacteria.

Phase IV:-Antioxidant, Anti-diabetic and Anticancerous activity.

In this phase the focus will be given on Antioxidant, Anti-diabetic and Anticancerous activity using standard protocols recommended by, Gulnazet.et.al (2014); Abdullah and Kashim, (2017); Anticancerous activity will be carried out employing out sourcing facility available at specific scientific research labs.

Phase V:-HPTLC Studies.

In this phase emphasis will be given on HPTLC analysis of selected plant extract in central instrumentation facility available at Science College Nanded using standard protocols (Sethi 1996).

Phase-VI:- Thesis writing and Submission. Scientific writing of thesis will be done for final submission to University.

Importance of study/society application

International status

In Israel Ephraim Philip Lansky et.al. (2006) made a study on *Ficus carica* latex against cancer. They found that the *Ficus carica* latex inhibits growth of a benz-[*a*]-pyrene-induced sarcoma and resulted in the disappearance of small tumors in albino rats. This work inspired the isolation and structure elucidation of a mixture of 6-*O*-acyl-β-D-glucosyl-β-sitosterol isoforms from the latex of *Ficus carica* that demonstrated useful agaist cancer.

In another study done in Bangladesh by Md.Shahadat Hossain et.al.(2014) showed that fruit extract of *Ficus racemosa* Linn (methanol extract) exhibited both antimicrobial activity and antifungal activity against the tested microorganisms like *Alternaria spp. , Colletotrichum spp. , Curvulariaspp , Fusarium spp.* They found that the *Ficus racemosa* fruits are very promising as an antimicrobial agent with special reference to *Staphylococcus aureus* infections as three concentrations of methanol extract were active against this bacterial strain. This antimicrobial profile of *Ficus racemosa* fruits can be exploited for developing a novel antimicrobial agent of high potential. Plants of this family are an important source of potentially useful structures for the development of new chemotherapeutic agents.

Again study done in Bangladesh by Amin et.al.(2015) found that the plant parts of *F. racemosa*, which has been used as a crude drug for the welfare of mankind in old civilization, is now of a matter of concern due to its unexplored potentials obtained by

various modern techniques. He reported that the *F. racemosa* possess compounds that have potential anti-diabetic activities.

National Status :-

Sunil Kumar Shah (2016) from Sri Satya Sai University of Technology & Medical Sciences, Sehore (M.P.) studied the ethanolic extract of *Ficus* species and found significant effect against microbes, worms and renal carcinoma in rat compared with the standard drugs. He reported that his studies on *Ficus racemosa* Linn. is very important in treatment of various diseases. *Ficus racemosa* Linn have the many pharmacological activities such as antidiuretic, anti-tussive, gastroprotective, anti-ulcer antifertility.

Manoj Aswar (2008) from Bharati Vidyapeeth University, Pune, made a study on preliminary phytochemical analysis and antimicrobial activity of *Ficus benghalensis* extracts. He reported that the presence of carbohydrates, flavanoids, amino acids, steroids, saponins and tannins like phytoconstituents in the extracts of *Ficus benghalensis*. The antimicrobial potency of the plant may be attributed to single or combined effect of the mentioned chemical groups. Accordingly the role of these constituents in eliciting antimicrobial properties requires further detailed phytochemical investigation. From his observations, all the extracts of roots of *Ficus benghalensis* were showing antimicrobial activity when compared to the standard drug.

Bhawanaet.al. (2018) from Guru Nanak Dev University, Amritsar (Punjab) studied the in vitro antibacterial activities of methanol extract of leaves of few species of *Ficus* i.e. *Ficus religiosa, Ficus benghalensis, Ficus elastica, Ficus benjamina and Ficus infectoria* against Gram negative bacterial strains. They observed antibacterial activities of *Ficus religiosa* as well as that of *Ficus benghalensis*. Their study provides scientific basis for the development of new pharmaceuticals from the plants as well as confirmed the traditional use of these plants in the treatment of bacterial infections.

Significance of the Study

Plants have been used for medicinal purposes long before prehistoric period. Treatment with medicinal plants is considered very safe as there is no or minimal side effects. These remedies are in sync with nature, which is the biggest advantage. The golden fact is that, use of herbal treatments is independent of any age groups and the sexes. Human beings are depending on botanicals directly or indirectly for the treatment of various ailments since ancient time, according to the World Health Organization, reports nearly 80% psychological and physical health mainly because of the two reasons one is they cannot afford the products of Western pharmaceutical industries and the second reason is due to side effects of the synthetic drugs followed by lack of healthcare facilities. India has a rich culture of medicinal herbs and spices, with high potential abilities for Ayurvedic, Unani, Siddha traditional medicines but only very few have been investigated chemically for their potential medicinal value. Rural masses of many developing countries still rely on traditional medicine for their primary health care needs and have found a place in dayto-day life. These medicines are relatively safer and cheaper than synthetic or modern medicine.

The proposed study in this Ph.D. work will be very much useful in finding an alternative for the treatment of diabetes and life threatening cancer. The bacteria and fungi are developing resistance against present available molecules. Therefore this study will open a window in finding new compound against bacterial and fungal infections.

Proposed Work plan/Formulation and structure of study/year wise plan of work and target to be achieved

The current research work planned for three years as follows.

First year: -

1. Literature Survey.
2. Ethnobotanical survey, collection and identification of plants.
3. Extraction of plant materials.

Second year: -

1. Phytochemical analysis of plants.
2. Antimicrobial activity of selected plants.
3. Antioxidant and anticancer activity of plants.

Third year:

1. Anti-diabetic activity of selected plant extract.
2. HPTLC analysis of plant extracts.
3. Data analysis and thesis writing for submission to the University.

Presentation of the research work by attending conference workshops will be done alongside all the activities as per mentioned above.

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